

# Asia Pacific Accreditation and Certification Commission File Management System (APACCFMS)

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**Abstract:** *With the advancement of Internet technology, file management within the organization also become more crucial and complicated. This is because the organization stores various types of files digitally in the specific server so that can be accessed anywhere and anytime with the Internet connection. With the file management technology, gives a great advantage to the organization in terms of time management to search related files, storage to keep the files and human resources. Thus, this paper presents Asia Pacific Accreditation and Certification Commission File Management System (APACCFMS) to allow the organization to manage and maintain their files digitally. This proposed system is developed with the aim to manage and store related files with the specific criteria for APACC Accreditation. We adopted the Agile methodology to ensure the development of the system is organized and meet all the requirements. Unit testing was conducted to ensure all system functions and modules were running as expected and no logic error occurs. Unit testing results indicated that the system is functioning as expected and can be used by the targeted user. With the APACCFMS, users are able to add, delete, view, and update the specific file everywhere and any time with the Internet connection using their own electronic devices. Future study is to extend this study to study the effectiveness of APACCFMS within the specific organization for APACC Accreditation.*

**Keywords:** Automation, File Management, Web-based system, Asia Pacific Accreditation and Certification Commission

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## 1. Introduction

File management is an important rule to ensure that all files within an organization are structured based on a specific concept and are readily accessible at any time if needed (Badashian et al., 2010). However, with the continuous advancement of technology especially the Internet, the need for a specific file management system is critical to ensure the availability of the file anywhere and at any time (Fan et al., 2018). Most data, such as personal details or disease information, are now stored digitally to a specific server or cloud service that used current technology. When a proper file management system is implemented, authorized people can search for specific files at a faster rate than the traditional method. This is due to the fact that the traditional method will physically store the file at the specified locations. If physical files are not properly managed then it will give

are great challenges to the user. For example, a user may be required to manually search for files, which will consume time and human effort energy. Aside from that, because of file is physically stored, the organization must maintain the storage room and ensure that it is free of any potential disasters such as float and building fire. As a result, the execution of a file management system is critical to ensuring that digitally stored files are properly managed and that only allowed users can access the system anywhere and at any time through an Internet connection through their electronic device with high-speed data transfer (Chen & Zeng, 2020).

CPSC established the Asia Pacific Accreditation and Certification Commission (APACC) in December 2014 with the goal of establishing a regional body for accreditation and certification of technical and vocational education and training (TVET) institutions (Kulanthaivel, 2016). According to (Mohd. Hashim, 2015), the APACC accreditation has seven (7) criteria such as Governance and Management, Teaching and Learning and Support to Students. As a result, the institution is required to prepare all necessary documentation or evidence based on the criteria. The accreditor then will review and validate all of the documents or evidence to evaluate whether or not the institution is eligible for the APACC certificate. Each criterion includes a different type of requirement, and each requirement necessitates a different set of documents and evidences. According to the Ministry of Higher Education (MOHE), APACC has awarded APACC Accreditation to 10 Polythetic institutions in Malaysia (Dato' Dr. Noraini Ahmad, 2020). With APACC accreditation within the academic institution, it will increase the quality and job prospects of its network institutions, apply for funding from donors and other lending agencies, and the institution's quality will be acknowledged by the international body (Khambayat, 2012).

As a result, in this study, the Asia Pacific Accreditation and Certification Commission File Management System (APACCFMS) is designed and developed with the goal of ensuring that the file management within the institution that wishes to apply for the APACC certificate is well organized and that only authorized users have access to the system functionality. The institution can use APACCFMS to manage their documents in accordance with specified criteria. All files uploaded to the APACCFMS will be stored on a specific online web server, allowing users to access the file from everywhere and at any time through an Internet connection. APACCFMS can also be made accessible to the accreditor APACC once the organization that wants to apply for the certificate is ready to be evaluated within a certain time frame. It will greatly benefit the accreditor to be able to verify and validate the institution file digitally from anywhere and at any time without physically visiting the institution.

The rest of this paper is structured as follows: Section 2 describes the literature review, which includes a comparison of the existing file management system based on the recent study within last 5 years; Section 3 discusses the methodology used to develop APACCFMS; Section 4 presents the APACCFMS; Section 5 discusses the implementation and testing of the APACCFMS; and Section 6 concludes this study.

## **2. Literature Review**

Many researchers have worked hard to create a file management service that provides a specific purpose and function for a organization or institution. For example, in a previous study by (Chen & Zeng, 2020), the authors proposed a scalable file management protocol with the objective of

developing a high-speed storage system. The authors combine the high bandwidth performance of a custom file system with the ability to expand storage capacity in a flexible manner. According to the author, the proposed system transmission speed can reach 6.4 Gbps with a 12 Terabyte (TB) storage system. Besides that, a previous study (Zhao, 2021) proposed a user-defined structure of an electronic achievement management system using the C# programming language. This system enables users to manage electronic file structures based on their specific requirements. The authors claimed that, the user can simply upload various types of files and media such as PDF files, audio files, and video files.

Furthermore, (Chiddarwar & Kumar, 2019) proposed an Online Course File Management System (OFCMS) suited to the educational institution. Academic staff can use this system to easily prepare and organize their various type of files before storing them in electronic form by using a simple and fast processes. The author's goal is to improve the process of academic work, reduce paper usage, and also provide access to the file at any time and from any place with an Internet connection. Besides that, (Yang et al., 2018) proposed the Cloud File Management Service System Based on LAN. According to the authors, the system can solve the problem of traditional file transfer and storage in a Local Area Network (LAN). The authors also stated that the system is capable of resolving security issues, managing multiple users, and being user friendly.

Aside from that, (Singh & Kumar, 2018) proposed Stackable Survival Storage File System (SSSFS) with the goal of securing and ensuring the archive data can be assessed for a long time. The authors use secret sharing scheme techniques to ensure data availability even when some servers are down or crash, and this technique is more secure than standard secret sharing. Finally, a previous study by (Muralidharan & Ko, 2019) proposed an InterPlanetary File System (IPFS) using an IoT framework. The IPFS protocol is capable of increasing the security of file sharing among users as well as communication between two devices or peers.

Therefore, in this study, we attempt to design and develop APACCFMS to demonstrate electronic file management within the organization. For instance, to help the organization to obtain certificate of accreditation from the APACC organization.

### **3. Methodology**

A methodology is a systematic, theoretical examination of the methods used to design and develop a system. One of the benefits of methodology is that it can serve as a guideline for system development, ensuring that it is done gradually and systematically. There are various methodologies that can be used in the development of a system. However, selecting the appropriate methodology is critical to ensuring effectiveness in the development of the system over a specific time period.

In this study, Agile methodology is used to ensure that the development of APACCFMS goes as planned and that all requirements are fulfilled successfully. According to (Altameem, 2015), the Agile software development process has several advantages, including increased performance and quality improvement. According to a previous study (Shaikh & Abro, 2019) utilising Agile methodology will help an organization produce a higher-quality product while spending less money and time.

The agile methodology consists 6 phases which is plan phase, design phase, develop phase, test phase, release phase, and feedback phase as shown in Figure 1 (Fireteanu, 2020; Hayat et al., 2019). Each phase is explained in detail in development of the proposed system as follows:

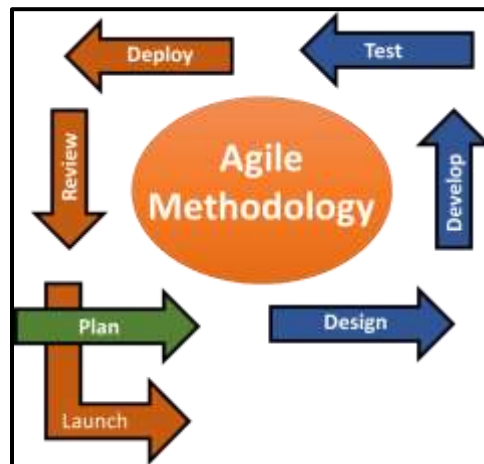


Figure 1: Agile Methodology

### 3.1 Plan Phase

In this phase, a proper method is implemented to acquire information about the existing file management system. For example, an interview session is conducted to identify and collect requirements from the targeted users. Other than that, conduct research from various platforms such as previous research papers, books, and related articles to identify the weakness and strengths of the existing system and to collect requirements to be used in the design phase.

### 3.2 Design Phase

The proposed system is designed in this phase in accordance with the requirements established in the previous phase. The graphical user interface (GUI) is created to allow the user to interact with the proposed system. Aside from that, a use case diagram, database design model, and flow chart are used to demonstrate the proposed system flow of process and how information is manipulated. This is executed to ensure that the system developer can develop the system precisely, as well as for documentation purposes.

### 3.3 Develop Phase

The system developer will design and write the source code in this phase based on the design acquired in the previous phase. The system developer's source code is designed and compiled using a variety of software and tools. In general, this phase is the longest of all because it is the backbone of the entire process and is highly dependent on the design phase. If the design phase was completed thoroughly, the development phase should not be a problem and can be completed within the time frame specified.

### 3.4 Test Phase

The developed system will be tested during the test phase to ensure that the code meets the specified requirements and to identify possible bugs and errors in each function created during the development phase. Unit testing is used in this study to ensure that the proposed system works as expected and that no logic errors occur when it is implemented in the real world.

### 3.5 Release Phase

After the developed system has been tested and fulfils all the requirements, the system will be uploaded to the targeted web server so that the user can use and test the system in a real environment.

### 3.6 Feedback Phase

Once all previous phases have been completed, the system will go through a feedback phase to identify areas for future work.

## 4. System Design and development

To design and develop APACCFMS, system architecture and system design were used to ensure that the system development flow was effective. The system architecture is the conceptual model that represents the flow processes of the designed system, while the system design is the process of defining the APACCFMS system architecture. According to (Durisic & Berenyi, 2019), good system architecture and system design will ensure that the development of proposed system meets and exceeds all user and quality requirements.

### 4.1 System Architecture

The system architecture of APACCFMS consists of two components which is users and file management. Figure 2 illustrates the architecture of APACCFMS.

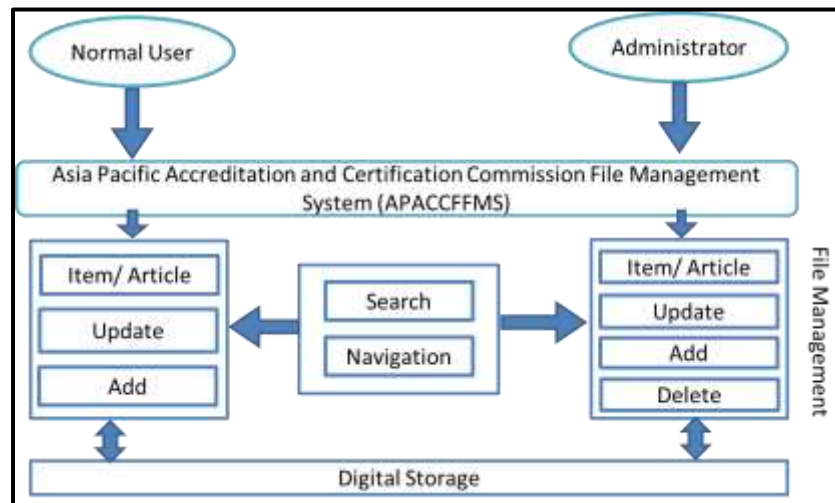


Figure 2: System Architecture of APACCFMS

#### a) Users

APACCFMS categorises users based on their access level and user history. APACCFMS can be used by two types of users: regular users and administrators. Each user has a unique role and is capable of performing specific functions and activities.

#### b) File Management

This component refers to a collection of files in a single format, which is PDF format. A normal user is authorised to upload files in accordance with their needs. Subsequently,

other normal user with system access can view and download the files available in the APACCFMS to their electronic devices.

## 4.2 System Design

In this study, use case diagram, system flowchart, and database design model was implemented to demonstrate the design and flow of process for APACCFMS. Figure 3 illustrates the use case diagram to describe the activity of each user when accessing the system.

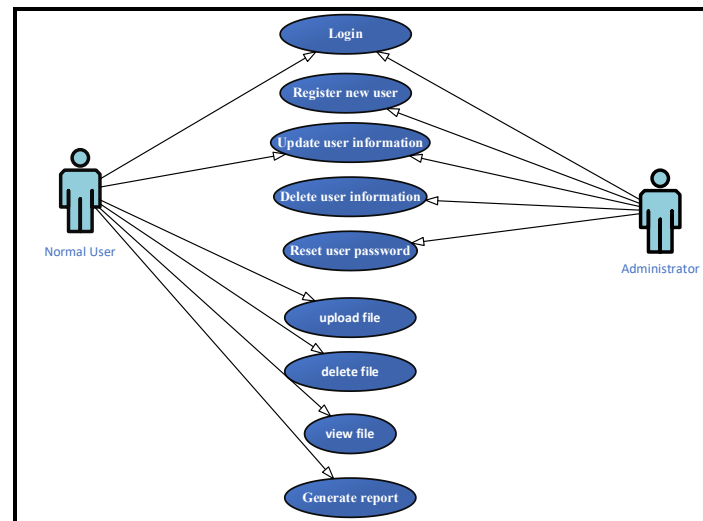


Figure 3: APACCFMS Use Case Diagram

According to Figure 3, users (normal users and administrators) must insert their credential information, which includes their Identification Number (IC) and password, during the authentication process. If the authentication process is successful, the user will be directed to the appropriate homepage based on their access level and will be able to perform the following actions:

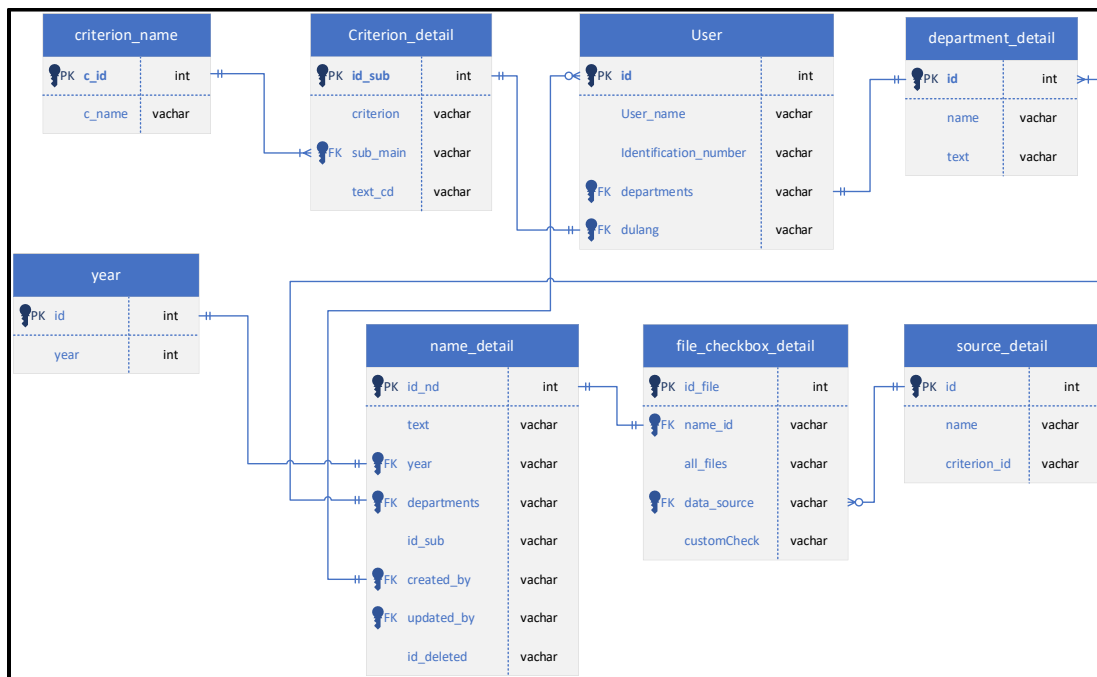
### a. Normal User

- Normal users can add, edit, and update existing files in the system based on their authorization user access level.
- Normal users can search related files in the system for other criteria that exist for reference or as an example for a specific purpose.
- Normal users are also able to update their personal information such as name, department, identification number, and password if needed.
- Normal users can generate and report that consist of all the filenames that exist in the system to a specific purpose such as decision making or for top management references.
- Normal user is required to update new password if the user password matches the default known password.

### b. Administrator

- The administrator has the capabilities to register, update, and delete the information of the users. Administrators should indeed fill out user-specific information such as name, identification number, department, and address when enrolling new users. The default

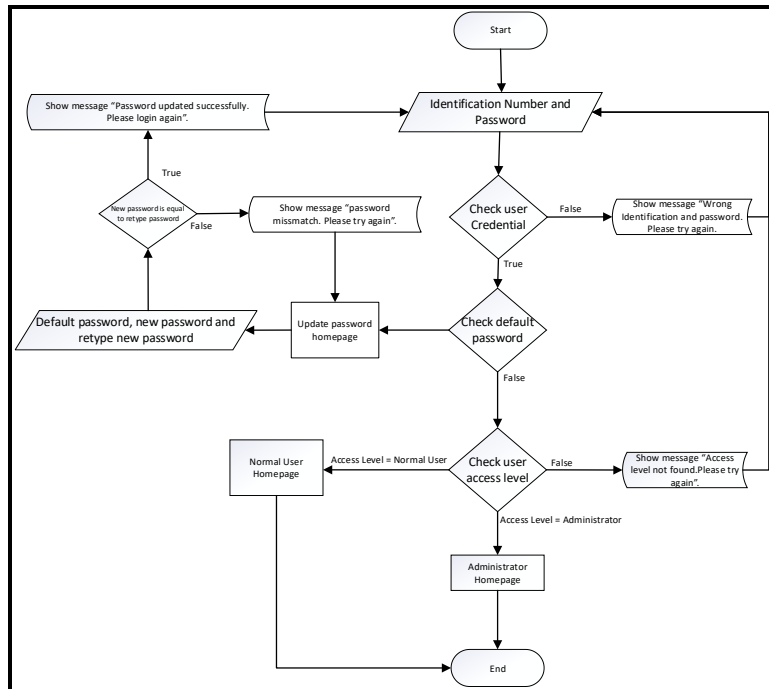
- known password will be assigned by APACCFMS so that new users can use it when logging into the system for the first time.
- The administrator also has the privilege to reset the user's password if the user forgets their password. If a user's password is reset, APACCFMS assigns the system's default known password, and users must use that password to access the system. If the user has successfully log in into the system using the default known password, APACCFMS will redirect to the specific page where the user can update the default password with the new password. If the user's new password was successfully updated, the user will be automatically logged out of the system and will be required to log in again using the new password.
  - The administrator also has the ability to manage information about specific criteria in APACC. If necessary, the administrator can add, delete, update, and view the criteria information. With this function, users from each criterion can ask the administrator if they want to make changes to the existing criteria information.



**Figure 4: APACCFMS Database Design Model**

Figure 4 illustrates the APACCFMS database design model, which allows the system to manage and manipulate information. According to (Gunjal & Koganurmah, 2014), poor database design leads to errors, which can lead to poor decision making. As a result, the implementation goods model is capable of producing a good database design. According to Figure 4, APACCFMS is made up of various tables, each of which stores unique information. Table User, for example, stores all of the related user's information, such as name, identification number, and departments. It should be noted that this table contains a foreign key to other tables, including criterion\_detail table and department\_detail table. This serves as a link and a cross-reference between the tables, ensuring that the information is accurately transferred to the user. Aside from that, table name\_detail will store the specific information related to each criterion. This table contains the following foreign keys: (1) department attribute: store the department unique key that refers to the

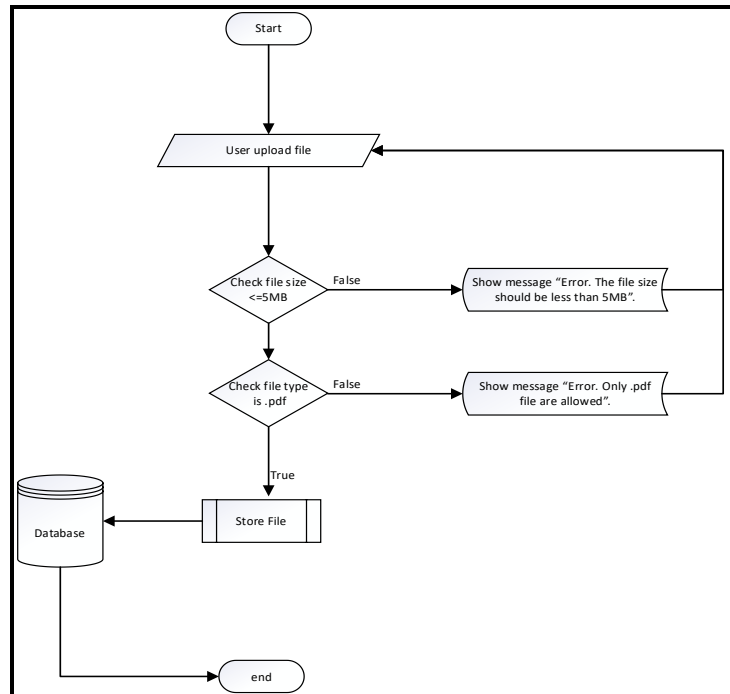
table department detail; (2) year attribute: store the year unique key that refers to the table year; and (3) updated\_by attribute: store the user unique key that refers to the table user.



**Figure 5: Login Flowchart**

According to Figure 5, in order to gain access to the APACCFMS, the user must enter their credential information, which consists of an identification number and a password. If the user credentials match the data in the database, APACCFMS will determine whether the password entered matches the default password or not. If the password entered matches a default password, the user will be redirected to the appropriate page where they can update their password. If the password update process is successful, APACCFMS will automatically end the user session and the user will need to log in again with the new password. Aside from that, upon successful login, the user will be redirected to their specific homepage based on their access level and will be able to perform a specific function (refer Figure 3).





**Figure 6: APACCFMS Upload File Flowchart**

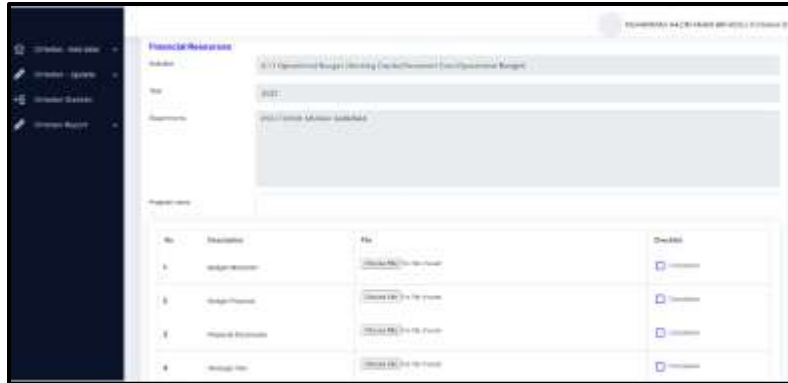
Based on Figure 6, a normal user can upload files to the APACCFMS to be stored in the database. However, the file uploaded must meet some requirements or rules before can be stored in the database. For example, the size of file must not exceed 5MB due to the storage size capacity. If the user tries to upload file size more than 5MB then a proper error message is displayed to notify the user. Other than that, APACCFMS only allowed one file type to be uploaded to the database which is a PDF file only. If the user tries to upload a file type other than a PDF file, then the system will display an appropriate error message. If all requirements and rules are fulfilled only then the file is stored in the database. If the upload file process success, then APACCFMS will display proper success message.

## 5. Implementation and Testing

APACCFMS was implemented using PHP as the programming language and MySQL database as the database management. The APACCFMS is integrated with the Laravel framework (Version 5.8) which supports PHP and MySQL database software. APACCFMS is initially run on a local Windows platform (Windows 10 Pro) with the XAMPP server (Version 3.2.2). This enables APACCFMS to run in a local environment without requiring an Internet connection. When the system is fully operational, the system source code and database are uploaded to the specific web hosting server. A specific web domain is also used to allow targeted users to access the APACCFMS in web browsers such as Google Chrome and Internet Explorer.

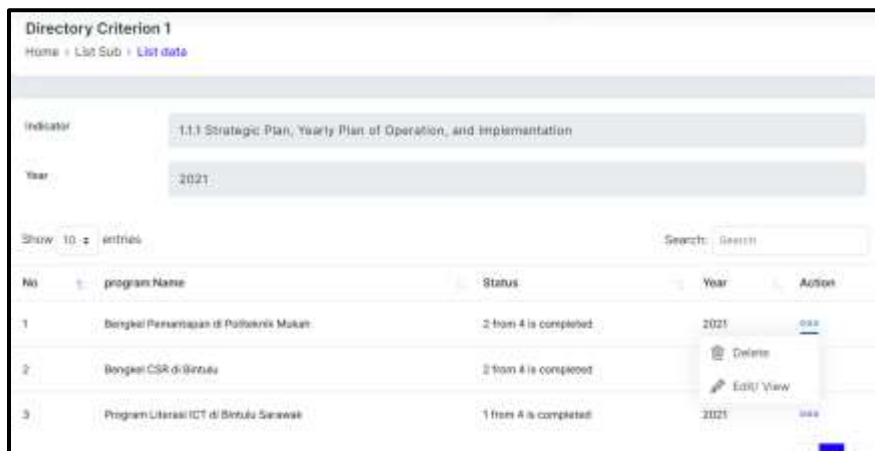
### 5.1 APACCFMS Graphical User Interface (GUI)

The graphical user interface (GUI) is the user interface that allows users (normal users or administrators) to interact with the APAACFMS functionality. Users can upload, view, update, delete, and update personal information.



**Figure 7: User Upload File Page**

Figure 7 illustrates the user interface for uploading a file based on specific user criteria. Before the user can submit a file to a specific database, APACCFMS will check the file format and size (refer to Figure 4). Only users are permitted to submit and store files and other information to the database if all of the rules are fulfilled. The user also must manually check the checklist to see whether the description is complete or not.



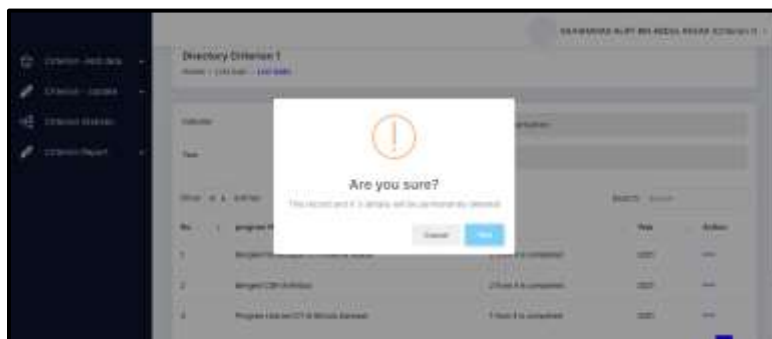
**Figure 8: User Update and Delete File Page**

According to Figure 8, the normal user also has the privilege to delete, update and view specific programs according to the needs. User are able to perform the modification activity by clicking the “Edit / View” button. After that, the system will display all the related information about the specific program. Then the user can update all the information and click the button “Update” and the system will validate all the input before store in the database (refer to Figure 9).



**Figure 9: User Update Specific Program Information**

Besides that, users are also able to delete specific program information including the files. It should be noted that, if the user performs the delete function, then APACCFMS will permanently delete the program information including the files and cannot be recovered. To prevent the user from accidentally clicking the delete button, a proper warning alert notification will be displayed every time user click the Delete button. If the user still wants to perform a deleted activity, then the user is required to click Yes! Button, only then APACCFMS will perform the delete function to delete the specific information (refer to Figure 10).



**Figure 10: Warning Notification for User Notification**

Figure 11 shows the GUI to allow users to generate reports for specific purposes such as decision-making by the top management. Users can view, download and print the report if necessary. It should be noted that the file generated is in PDF file format only. This is because PDF is a well-known application standard used by society (Rico et al., 2019).



**Figure 11: User generate PDF report page**

## 5.2 Unit Testing

According to the previous study by, (Tillmann et al., 2010), (Motepalli et al., 2020) and (Bhaskar et al., 2020), unit testing refers to the method and exercising the source code under a test phase and asserting properties of the code's expected behaviour. The implementation of the unit testing can give a great advantage to the developer such as improving the system quality and reducing the system development cost (Bandara & Perera, 2020). Therefore, in this study, each function module of APACCFMS was tested using correct and incorrect data. This is to ensure the output was as expected. It is consistent with a previous study by (Buang & Daud, 2012) and (Sun et al., 2019) that used correct and incorrect data to test the functionality of the system. Table 1 shows the unit results of APACCFMS using correct and incorrect data.

**Table 1: APACCFMS Unit Testing results**

Module	Test Data	Expected Result	Result
User login (normal user or administrator)	The user enters the correct Identification Number and password	The success message is displayed and users is redirected to the user homepage based on the user access level	As expected
	The user enters the incorrect Identification Number and password	The error message is displayed and users is redirected back to the login page	As expected
User upload file	User upload file which consists size more than 5 MB with xlsx file format	The error message is displayed to alert the user and the file is automatically deleted	As expected
	User upload file which consists size less than 5 MB with PDF file format	The success message is displayed and the file is stored in the database	As expected

## 6. Discussion and Conclusions

A web-based file management system which is APACCFMS has been successfully designed, developed, implemented, and tested. To design and develop the system, various tool is used in order for the development process to be smooth and able to finish within a period of time. After the system is fully developed, the system will be tested by implementing unit testing in order to ensure the system functionality is functioning and no logic error occurs. In the unit testing, each individual module of the developed system is being tested using a set of input data. This set of input data consisted of correct and incorrect data. Based on the test result in Table 5.1, it can be concluded the system has passed the unit testing and is ready to be implemented to the dedicated server. Last but not least, the system also will be uploaded to the dedicated web-server to allow the targeted user to use the system functionality. The specific domain is used to allow users to access the system by using a web browser such as Google Chrome browser.

As conclusion, the development of APACCFMS will help users of the specific organization to manage their files digitally. With APACCFMS, users can add, view, update and delete the specific file. Other than that, users can access APACCFMS anywhere and anytime with an Internet connection. Future work would include extending this study to examine the effectiveness of the APACCFMS in the organization to manage their file systematically in terms of storage and time allocation.

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